

Gamma-Ray Emission from Cygnus X-1

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Abstract

Strong evidence for relativistic positron-electron pair plasma in Cygnus X-1, in the form of enhanced gamma-ray emission at ~ 1 MeV, has been reported by several groups over the last decade¹⁻⁵. Such emission, if firmly established, would significantly enhance our knowledge of the high energy processes occurring in such black hole systems as Cygnus X-1, the galactic center and in AGN. Hence, it is imperative that we collect more experimental evidence in order to put these results on the most solid ground possible. However, the irregular and episodic nature of the "enhanced" MeV emission seen in Cygnus X-1 makes it somewhat difficult, using standard instruments, to implement an effective observational program to capture such sporadic occurrences. The Burst and Transient Source Experiment (BATSE) onboard the Compton Gamma Ray Observatory, using the Earth as an occulter⁶⁻⁷, has a powerful capability to provide uninterrupted, long-term monitoring of cosmic sources. In this paper, I report preliminary results of the temporal and spectral variability of the 20-2000 keV broad band emission of Cygnus X-1, based on approximately 180 days of data from 20 August 1991 to 15 February 1992. This investigation is a joint effort between the JPL investigators and the PI team at the Marshall Space Flight Center. Our early results⁸, based on a limited sample of data, showed possible spectral variability between a Comptonized⁹ form and a nearly power-law form, on a time scale of one day. Comparison of these results with measurements made by the OSSE and COMPTEL experiments will be also discussed.

References:

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